





ABB MEASUREMENT SOLUTIONS FOR DAIRIES



Quality and hygiene are the focus of dairy production. Expertise and compliance with process parameters are the conditions for an excellent product. The demand for efficient and energy optimised production is another challenge for plant operation.

With our versatile sensor solutions we support you in your daily work. ABB measurement and analysis technology offers you products for effective monitoring and process control of dairy production as well as necessary ancillary processes.

For an easy product selection you will find assistance from the W H Good Automation instrumentation support team. Diverse services and training complete the offer over the entire life cycle.



FEH610 / FEH630 - EM Hygienic Flowmeter

- Value error: 0.4% of rate, option for 0.3% or 0.2%
- ATEX, IECEx, cFM, 3A, FDA-approved materials
- Empty pipe, gas bubble, electrode impedance, conductivity and sensor temperature monitoring
- Flowmeter sensor and transmitter integrity check utilising fingerprint technology
- The clean choice for all hygienic applications



FSM4000 - EM Hygienic Flowmeter

- High accuracy $< \pm 0.5\%$ of rate ($> DN 2$)
- Fluid temperature -40 to 130°C
- Hygienic certification: 3A
- Specially designed to measure liquids in the food & beverage industries
- Used to measure fast changing processes, two phase liquids, continuous and pulsating flows



FCB100 / FCH100 - Coriolis Mass Flowmeter

- Full parameter access with up to 115 kBaud
- Aluminium housing or all stainless steel solution
- DTM based diagnostic and operability functions
- Superior accuracy & speed for filling applications
- Multivariable measurement of mass flow, density and temperature in one device
- Wide measurement span in a single meter



FCB430 / FCH430 - Coriolis Mass Flowmeter

- High accuracy: Mass/volume: 0.15 %/0.1 %, Density: 2g/l or 1g/l, Temperature: -50 to 205°C
- DensiMass software for concentration measurement
- FillMass software for filling application control
- EHEDG, FDA compliant (*FCH model*)
- ATEX, IECEx, cFMus, NEPSI, SIL2
- MID / OIML approval for legal metrology



FCB450 / FCH450 - Coriolis Mass Flowmeter

- High accuracy: Mass/volume: 0.15 %/0.1 %, Density: 2g/l or 1g/l, Temperature: -50 to 205°C
- DensiMass software for concentration measurement
- FillMass software for filling application control
- EHEDG, FDA compliant (*FCH model*)
- ATEX, IECEx, cFMus, NEPSI, SIL2
- MID / OIML approval for legal metrology





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FSV430 / FSV450 - Vortex Flowmeter

- High accuracy: Liquids $\pm 0.65\%$ of rate, Gas/steam $\pm 0.9\%$ of rate
- ATEX, IECEx, cFMus, NEPSI, SIL2-certified in accordance with IEC 61508
- Easy set-up function, meter configuration through the glass (TTG) with closed cover
- Available in flange-mount and wafer-type



FSS430 / FSS450 - Swirl Flowmeter

- High accuracy: $\pm 0.5\%$ of rate
- ATEX, IECEx, cFMus, NEPSI, SIL2-certified in accordance with IEC 61508
- Only the shortest possible straight pipe lengths are required
- Measures gases, liquids and steam over many temperatures in almost any application



TSHY - Temperature Sensor

- Short response time
- Mounting suitable for CIP
- Temperature range: -50 to 250°C
- Output signal: Sensorsignal, 4 to 20mA, HART
- For inline or surface measuring
- In accordance with Directive 85/357/EEC or the German Milk Executive Order (MVO)



TSP - Temperature Sensor

- Exchangeable measuring inset
- Optional with local digital display
- Extremely robust connection head
- Solid drilled bar thermowells
- 4 to 20mA, HART, PROFIBUS PA 3.01, Foundation Fieldbus ITK 5.2
- SIL2, IECEx, ATEX EExi, EExd, EACEx



261 - Pressure Transmitter

- Separating diaphragm with optimised design
- Accurate and reliable sensor technology
- In-house production of the food & beverage process connection with special shape
- Temperature balancing of the complete transmitter with process connection
- Continuous filling without internal separating diaphragm



23 / 26 - Hygienic Control Valve

- Size DN 25 to DN 125 with pneumatic actuator
- 1.4404 stainless steel housing, suitable for CIP threaded process connection to DIN 11851 or welded ends (other connections upon request)
- Seat ring with metallic or soft seal
- No external tubing required due to internal air channels



23 / 24 - Control Valve

- Size DN 15 to DN 100 with pneumatic actuator
- Cast steel or stainless steel
- Maintenance-free PTFE lip rings, pure graphite rings or hermetic bellows seal
- Seat ring with metallic or soft seal
- No external tubing required due to internal air channels



ControlMaster Range

- Crystal-clear, full-colour TFT display
- 2 universal inputs, 1 analogue output and 1 relay fitted
- Ethernet and MODBUS[®] comms
- IP 66 and NEMA 4X environmental protection
- Flexible functionality including maths, logic and totalisation providing power to solve complex application requirements



SM500 - Paperless Recorder

- Wall, pipe or panel-mount, ultra-slim design, $< 90\text{mm}$ (3.5in.) deep
- GAMP validation - 21 CFR part 11 compliant
- IP 66 and NEMA 4X environmental protection
- Batch recording - easy tracking of batch processes
- 12 software recording channels - up to 7 analogue/digital inputs, maths function results, MODBUS[®] signals



RVG200 - Paperless Recorder

- Scalable high spec I/O - high accuracy and stability compliant to AMS 2750, recording of up to 24 channels, optional relays, mA outputs and Tx PSU
- Automatic data collection via Ethernet combined with powerful data analysis using DataManager Pro software
- Maths and logic, batch recording, flow totalisation



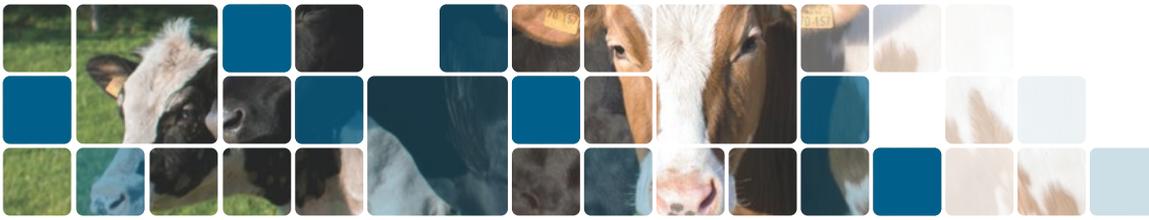


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Recommended ●
Possible ○

Hygienic flowmeter
FEH610 / FEH630

Pointed head
electrodes
FEH610 / FEH630

FEH630 with
presetting counter

Hygienic flowmeter
FSM4000

Coriolis mass
flowmeter
FCB100 / FCH100

Coriolis mass
flowmeter
FCB430 / FCH430

ABB Device



Process step

	Hygienic flowmeter FEH610 / FEH630	Pointed head electrodes FEH610 / FEH630	FEH630 with presetting counter	Hygienic flowmeter FSM4000	Coriolis mass flowmeter FCB100 / FCH100	Coriolis mass flowmeter FCB430 / FCH430
Milk reception						
Flow raw milk	○	○	●		○	○
Temperature raw milk						
Fill level buffer tank						
Monitoring temperature milk in buffer tank						
Pasteurisation						
Temperature drink milk after heater						
Temperature drink milk after heat holding						
Outlet temperature drink milk						
Pressure loss over heater/recooler						
Fill level feed tank						
Pressure maintenance drink milk						
Control hot water						
Control cooling brine						
Flow raw milk	●	○	○			○
Supervise pasteurisation						
Separation / Standardisation						
Flow milk to separator	●	○	○			○
Flow control Flow milk to separator						
Flow cream		●				●
Density/concentration cream					○	○
Flow skim milk	●	○				○
Control cream adding						
CIP / SIP						
Flow CIP medium	●	○	○	○		○
Temperature CIP medium						
Flow dishwater	●	○	○			○
Control steam						
Supervise differential pressure						
Frequent general measurements						
Flow of fatty medium		●				●
Flow of medium with low conductivity				●		○
Flow of medium with solid content (e.g. fruit)				●		●
Flow of steam						○
Flow of hot water	●					○
Flow of cooling brine	●	○	○	○		○
Presetting counter functionality			●			
Filling > 5s fill time			●		○	
Overburden pressure						
Steam pressure						
Temperature steam						
Temperature hot water						
Temperature cooling brine						
Control flow/pressure product						
Control flow/pressure steam						

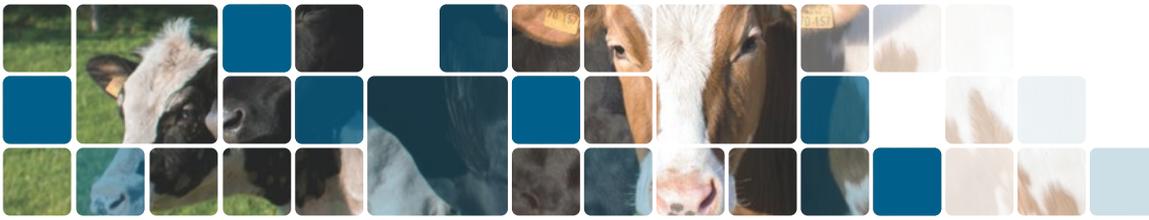


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Milk is a complex mixture of substances that is processed to make a large variety of finished products such as butter, yogurt, cheese, cream and so on.

In larger dairies, milk is treated in largely automated, closed production lines. Due to the complexity of some of the process steps, the delicate nature of the raw product and the need to adhere to strict hygiene regulations, the instruments that measure, monitor, regulate and control the process line must be accurate, reliable, robust and designed for hygiene.

ABB supplies a wide range of such instruments, the characteristics of which can be explored by describing how they are used.



The Whey Forward...

Reliable and Accurate Instrumentation for the Dairy Industry

For many parts of the world, milk is an important source of nutrition. Milk contains water, fat, protein, milk sugar (lactose), enzymes, vitamins, minerals and trace elements. It can be processed to produce butter, cream, cheese, yogurt, etc. Much of this processing is carried out in large dairies that employ a high degree of automation.

The complex composition of milk and the potential danger to health should something go wrong in the processing means that great care has to be taken at each step as the raw milk is turned into the finished product. In larger dairies, to ensure good quality and product consistency, most parts of the process are instrumented.



Most parts of the dairy - milk processing, cheese making, yogurt production, etc. are similar in terms of instrumentation. Looking in detail at one part - the milk production line, for instance, gives a good indication of how ABB instruments can help dairy operations as a whole.

Delivery & Pasteurisation

Raw milk is delivered to the dairy in tankers and is immediately tested for bacteria or other contaminants. Subsequently, if suitable, it is transferred to storage tanks or goes straight into the process. At this point, the delivery quantities will usually be determined by a magnetic-inductive flowmeter such as the ABB HygienicMaster FEH610 / FEH630.



The HygienicMaster has a coating of vacuum resistant PFA and employs stainless steel elements to maintain hygiene. It is the most common flowmeter found in an ABB-equipped dairy. If the milk has warmed in transit, it is cooled to 5°C and stored in agitated tanks.

ABB level/pressure monitoring devices, e.g. SMW and 261 GG/AG types, can be used to monitor tank levels here and throughout the dairy.



Pasteurisation is a core activity of any dairy. Here, the raw milk is processed into drinking milk or is prepared for use in other products, such as cheese.

Pasteurisation involves heating the milk for 15 to 30 seconds to around 74°C and then immediately cooling it to kill any harmful organisms. When cooling, much of the heat energy is won back by carefully controlled heat exchangers. Overpressure is applied to the treated milk to ensure it never comes in contact with untreated milk.

ABB's pressure and temperature products such as the 261GG/AG gauge pressure transmitter, SensyTemp TSHY thermometer for sanitary applications and the TTH300 head-mount temperature transmitter are ideal for most stages of the milk treatment process.



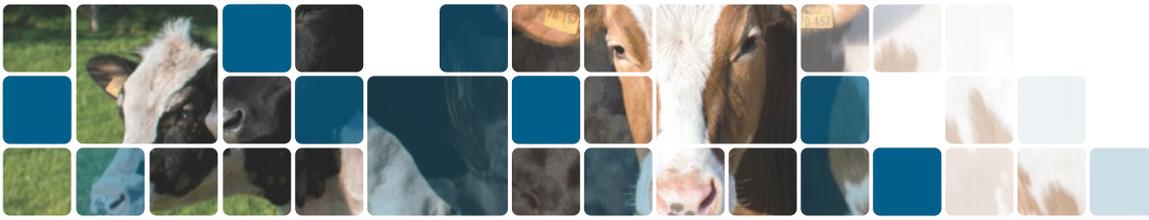


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Here, and throughout the dairy, flows can be controlled with the ABB TZDIC intelligent digital positioner. These stainless steel smart positioners combine high accuracy and adaptable control functions, and their auto-stroke functions make them easy to commission. The TZDIC requires little maintenance and works over a wide temperature range, making it suitable for the milk production line.



Separation & Standardisation

To clean the milk of contaminants and to isolate components of individual interest, such as cream and skimmed milk - the milk goes through a separation procedure

The milk then has to be standardised. Raw milk has a higher fat content than the law recommends for drinking milk so after the cream is removed from the milk it is added in again in a controlled manner to achieve the correct fat levels.

To keep within the law and to not "waste" valuable cream by adding too much, this blending process has to be tightly controlled. As well as using the instrumentation described above, this stage of the process also utilises the ABB CoriolisMaster FCB150 / FCH150 or FCB450 / FCH450.

The CoriolisMaster is well suited to online cream concentration correction.

As well as accurately measuring mass flow by exploiting the Coriolis effect, the device also makes an independent density measurement using the resonant frequency of the filled system thus making it easy to track the changing cream concentration.

The device has a flow rate measurement accuracy of 0.1% (FCB150 / FCH150 and FCB450 / FCH450). The CoriolisMaster is also less prone than other flowmeters to give erroneous readings when gas bubbles are entrained in the flow, though large cavitation events will skew measurements.



Homogenisation & Packaging

To prevent the cream in the milk from separating and floating to the top in the finished product the milk is passed through a fine sieve under pressure to break up the larger fat globules.

A cavitation technique further breaks up the globules so that they are distributed throughout the medium and have less tendency to collect at the top. The milk is then filled into its final container.

The instrumentation described earlier is used in these process steps too to measure flow, pressure and level. The ability of the instruments to withstand high pressures while maintaining hygienic levels is an important consideration.

Hygiene

Rigorous daily cleaning and sterilisation is an essential aspect of the dairy business. Temperature sensors and flowmeters ensure that the cleaning materials are of sufficient temperature and that they reach all parts intended. Conductivity measurements can determine flushed impurity levels and can ascertain if contamination levels are high enough to warrant the addition of further cleaning agents.

Service

As well as delivering the instruments themselves, ABB also organises the installation and commissioning of the automation instrumentation, as well as provides regular maintenance and repair.

Optimising many aspects

Milk is a complex product to process. To successfully cater for the critical parameters involved in milk processing - such as temperature, concentrations and flow quantities - and ensure top quality and hygiene, a dairy will be equipped with the very best control, sensing and instrumentation technology.

This automation technology will also help optimise raw milk use, reduce energy consumption and ease daily tasks like cleaning. ABB's wide range of instrumentation fits in well with the rigorous demands of the milk processing industry.





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